

1 1. (Amended Twice) A method for dithering color in a graphics system that displays a
2 group of pixels and wherein the color of the pixels is represented by color shades having fewer
3 than eight bits, the method comprising [the steps of]:
4 (a) generating an eight bit color shade value for each pixel representing a desired color for
5 each pixel;
6 (b) truncating the desired eight bit color shade value to obtain a truncated color shade
7 value;
8 (c) generating a FRAC value for each pixel from the truncated bits of said eight bit color
9 shade value, the FRAC value determined by a predetermined number of least
10 significant bits in the eight bit color shade value and providing an indication of
11 the proximity of a desired eight bit color shade value to an eight bit shade value
12 that is equivalent to a shade value having less than eight bits;
13 (d) producing a ramp value for each pixel using said FRAC value to select one from a
14 group of plurality of ramp values having different probabilities reflecting
15 proximity to the truncated color shade value, wherein said ramp value encodes a
16 discrepancy between the desired eight bit color shade value and the truncated
17 color shade value, each of the ramp values including a plurality of bits, the
18 probability of a ramp value dependent upon the values of the plurality of bits in the ramp value;
19 and
20 (e) using a selected bit from said ramp value to select a color shade value of fewer than
21 eight bits that determines the color of each pixel, the selected bit having a bit

22 value that determines if the truncated color shade value is to be incremented to
23 obtain the color shade value that determines the color of each pixel.

1 2. (Unchanged) The method of claim 1, wherein said truncated bits in step (c) includes fewer
2 than the two least significant bits of said desired eight bit color shade value.

1 3. (Unchanged) The method of claim 2, wherein the truncated bits includes the three least
2 significant bits of said desired eight bit color shade value.

1 4. (Unchanged) The method of claim 2, wherein the step of using a bit from said ramp value
2 to select a color shade value of fewer than eight bits (step e) includes using a value from a look-up
3 table to select said bit from said ramp value.

1 5. (Unchanged) The method of claim 4, wherein each pixel has an x address and a y address
2 and said value from said look-up table is determined from the x address and the y address of the
3 pixel to be rendered.

1 6. (Amended Twice) A method for dithering pixel color in a graphics system that displays a
2 group of pixels in which primary pixel colors are represented by color shades having fewer than
3 eight bits comprising [the steps of]:
4 (a) generating an eight bit color shade value for each pixel representing a desired color for
5 each pixel;
6 (b) truncating the desired eight bit color shade value to produce a first color shade value
7 comprising fewer than eight bits;

8 (c) generating a FRAC value for each pixel representing the truncated bits of said desired
9 eight bit color shade value, the FRAC value determined by a predetermined
10 number of least significant bits in the eight bit color shade value and providing an
11 indication of the proximity of a desired eight bit color shade value to an eight bit
12 shade value that is equivalent to a shade value having less than eight bits;
13 (d) producing a ramp value for each pixel using said FRAC value to select one from a
14 group of plurality of ramp values having different probabilities reflecting
15 proximity to the truncated color shade value, wherein said ramp value encodes a
16 discrepancy between the desired eight bit color shade value and the first color
17 shade value, each of the ramp values including a plurality of bits, the probability
18 of a ramp value dependent upon the values of the plurality of bits in the ramp
19 value;
20 (e) producing an addend value for incrementing said first color shade value;
21 (f) incrementing said first color shade value by said addend value to produce a second
22 color shade value; and
23 (g) selecting said first color shade value or said second color shade value to determine the
24 color of each pixel in said group of pixels, the value of a bit selected from a ramp
25 value determining if said first color shade value or said second color shade value is
26 to be selected.

1 7. (Unchanged) The method of claim 6, wherein said step of producing a ramp value (step d)
2 includes producing a ramp value that includes a number of logic one values indicative of said
3 discrepancy between the desired eight bit color shade value and the first color shade value.

1 8. (Unchanged) The method of claim 6, wherein said step of selecting said first color shade
2 value or said second color shade value (step g) is performed in response to the state of a bit from
3 said ramp value.

1 9. (Unchanged) The method of claim 8, wherein each pixel has an x address and a y address
2 and said x address and said y address of a pixel to be rendered are used to obtain a value from a
3 look-up table, said look-up table value used to select said bit from said ramp value.

1 10. (Unchanged) The method of claim 6, wherein said step of incrementing said first color
2 shade (step f) produces an overflow signal if an overflow condition is present.

1 11. (Unchanged) The method of claim 10, wherein said step of selecting said first color shade
2 value or said second color shade value (step g) is performed in response to said overflow signal.

1 12. (Amended Twice) A graphics system that displays color shades based upon binary
2 representation having fewer than eight bits, wherein said graphics system initially receives a desired
3 eight bit binary representation for each color shade that is used by the graphics system to render
4 pixels in a pixel grid, said desired eight bit binary representation including upper order bits and
5 lower order bits, comprising:

6 select fractional logic that receives the desired eight bit binary representation and wherein
7 said select fractional logic produces on its output lines the lower order bits of said
8 desired eight bit binary representation value, the lower order bits providing an
9 indication of the proximity of a desired eight bit color shade value to an eight bit
10 shade value that is equivalent to a shade value having less than eight bits;

11 a look-up table that produces a control value based upon an address of each pixel; and
12 ramp probability logic coupled to said select fractional logic and said look-up table, said
13 ramp probability logic producing a ramp value using output from said select
14 fractional logic to select one from a group of plurality of ramp values having
15 different probabilities reflecting proximity to a color shade having a binary
16 representation fewer than eight bits, said ramp value encoding a discrepancy
17 between said desired eight bit binary representation and said binary
18 representations having fewer than eight bits, each of the ramp values including a
19 plurality of bits, the probability of a ramp value dependent upon the values of the
20 plurality of bits in the ramp value, the value of a selected bit in a ramp value
21 determining if a color shade value of fewer than eight bits is to be incremented to
22 obtain the color shade value that determines the color of a pixel.

1 13. (Unchanged) The graphics system of claim 12, further including an addend generator that
2 produces an addend value for incrementing said binary representations having fewer than eight bits.

1 14. (Unchanged) The graphics system of claim 13, further including add logic for producing
2 the sum of said addend value and said binary representations having fewer than eight bits.

1 15. (Unchanged) The graphics system of claim 14, further including a first multiplexer for
2 selecting a bit from said RAMP value, and wherein the bit selection is controlled by said control
3 value produced from said look-up table.

1 16. (Unchanged) The graphics system of claim 15, further including a second multiplexer to
2 which said binary representation having fewer than eight bits and said sum are provided as input

3 signals, and wherein said second multiplexer selects one of a said input signals, said input signal
4 selection controlled by a control signal and said control signal determined by said ramp value.

1 17. (Unchanged) The graphics system of claim 12, wherein said ramp value includes a number
2 of logic 1 values indicative of the discrepancy between said desired eight bit binary representation
3 and said binary representations having fewer than eight bits.

1 18. (Unchanged) The graphics system of claim 17, wherein said graphics system represents
2 color using five bits for red and five bits for blue.

1 19. (Unchanged) The graphics system of claim 18, wherein said graphics system represents
2 color using six bits for green.

1 20. (Unchanged) The graphics system of claim 15, wherein said add logic produces an
2 overflow output signal upon detection of an overflow condition.

1 21. (Unchanged) The graphics system of claim 20, wherein said control signal is also
2 determined by said overflow signal.

22. (New) A method for dithering color in a graphics system that displays a group of pixels and wherein the color of the pixels is represented by color shades having fewer than eight bits, the method comprising:

- (a) generating an eight bit color shade value for each pixel representing a desired color for each pixel;
- (b) truncating the desired eight bit color shade value to obtain a truncated color shade value;
- (c) generating a FRAC value for each pixel from the truncated bits of said eight bit color shade value;
- (d) producing a ramp value for each pixel using said FRAC value to select one from a group of plurality of ramp values having different probabilities reflecting proximity to the truncated color shade value, wherein said ramp value encodes a discrepancy between the desired eight bit color shade value and the truncated color shade value;
- (e) mapping a dither value to a bit position within said ramp value; and
- (f) using a bit from said ramp value to select a color shade value of fewer than eight bits that determines the color of each pixel.

23. (New) An electronically-readable medium storing a program for permitting a computer to perform a method for dithering color in a graphics system that displays a group of pixels and wherein the color of the pixels is represented by color shades having fewer than eight bits, the method comprising:

- (a) generating an eight bit color shade value for each pixel representing a desired color for each pixel;
- (b) truncating the desired eight bit color shade value to obtain a truncated color shade value;
- (c) generating a FRAC value for each pixel from the truncated bits of said eight bit color shade value;
- (d) producing a ramp value for each pixel using said FRAC value to select one from a group of plurality of ramp values having different probabilities reflecting proximity to the truncated color shade value, wherein said ramp value encodes a discrepancy between the desired eight bit color shade value and the truncated color shade value;
- (e) mapping a dither value to a bit position within said ramp value; and
- (f) using a bit from said ramp value to select a color shade value of fewer than eight bits that determines the color of each pixel.

24. (New) An electronically-readable medium storing a program for permitting a computer to perform a method for dithering color in a graphics system that displays a group of pixels and wherein the color of the pixels is represented by color shades having fewer than eight bits, the method comprising:

- (a) generating an eight bit color shade value for each pixel representing a desired color for each pixel;
- (b) truncating the desired eight bit color shade value to obtain a truncated color shade value;

(c) generating a FRAC value for each pixel from the truncated bits of said eight bit color shade value, the FRAC value determined by a predetermined number of least significant bits in the eight bit color shade value and providing an indication of the proximity of a desired eight bit color shade value to an eight bit shade value that is equivalent to a shade value having less than eight bits;

(d) producing a ramp value for each pixel using said FRAC value to select one from a group of plurality of ramp values having different probabilities reflecting proximity to the truncated color shade value, wherein said ramp value encodes a discrepancy between the desired eight bit color shade value and the truncated color shade value, each of the ramp values including a plurality of bits, the probability of a ramp value dependent upon the values of the plurality of bits in the ramp value; and

(e) using a selected bit from said ramp value to select a color shade value of fewer than eight bits that determines the color of each pixel, the selected bit having a bit value that determines if the truncated color shade value is to be incremented to obtain the color shade value that determines the color of each pixel.

25. (New) An electronically-readable medium storing a program for permitting a computer to perform a method for dithering pixel color in a graphics system that displays a group of pixels in which primary pixel colors are represented by color shades having fewer than eight bits comprising:

(a) generating an eight bit color shade value for each pixel representing a desired color for each pixel;

(b) truncating the desired eight bit color shade value to produce a first color shade value comprising fewer than eight bits;

(c) generating a FRAC value for each pixel representing the truncated bits of said desired eight bit color shade value, the FRAC value determined by a predetermined number of least significant bits in the eight bit color shade value and providing an indication of the proximity of a desired eight bit color shade value to an eight bit shade value that is equivalent to a shade value having less than eight bits;

(d) producing a ramp value for each pixel using said FRAC value to select one from a group of plurality of ramp values having different probabilities reflecting proximity to the truncated color shade value, wherein said ramp value encodes a discrepancy between the desired eight bit color shade value and the first color shade value, each of the ramp values including a plurality of bits, the probability of a ramp value dependent upon the values of the plurality of bits in the ramp value;

(e) producing an addend value for incrementing said first color shade value;

(f) incrementing said first color shade value by said addend value to produce a second color shade value; and

(g) selecting said first color shade value or said second color shade value to determine the color of each pixel in said group of pixels, the value of a bit selected from a ramp value determining if said first color shade value or said second color shade value is to be selected.

REMARKS

The undersigned thanks Examiner Thu Nguyen for granting previous phone interviews regarding this application.